

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Adolph et al.

Serial No.

Group Art Unit:

Filed: February 4, 2000

For: HYDROLYZABLE  
PREPOLYMERS FOR EXPLOSIVE AND  
PROPELLANT BINDERS

Examiner:

**PRELIMINARY AMENDMENT**

Please amend the attached continuation application, which is based upon application serial number 09/497,873, filed on February 4, 2000, as follows.

**In the Specification**

Please add the following prior to the first line, page one of the specification:

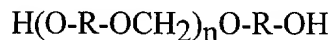
This application is a continuation of pending application number 09/497,873, filed February 4, 2000.

**In the Claims**

Please delete claims 1, 2, and 13-20.

Please add the following claims:

21. A degradable prepolymer for explosive and propellant compositions, comprising the general formula



wherein R comprises a carbon or carbon/heteroatom chain;

wherein n comprises a numeral from about 1 to about 20; and,

wherein the -O-CH<sub>2</sub>-O- linkage within the backbone of the prepolymer comprises a hydrolyzable moiety.

22. The degradable prepolymer of claim 21, wherein the prepolymer degrades upon reacting with an acid composition comprising a concentration of about 2.0N or less.

23. A degradable prepolymer product for explosive and propellant compositions prepared by condensing a diol with formaldehyde in a ratio wherein substantially all of the formaldehyde reacts, so that at least one -O-CH<sub>2</sub>-O- linkage is formed within the backbone of the prepolymer as a hydrolyzable moiety and the formation of terminal -O-CH<sub>2</sub>-O- groups is minimized.

24. The degradable prepolymer product of claim 23, wherein the diol comprises a molecular weight of from about 400 to about 500.

25. The degradable prepolymer product of claim 23, wherein the diol comprises polyethylene glycol comprising a molecular weight of about 400.

26. The degradable prepolymer product of claim 25, wherein the diol comprises polycaprolactone comprising a molecular weight of about 500.

27. A degradable prepolymer product for explosive and propellant compositions prepared by the steps of:

condensing a diol with formaldehyde so that at least one -O-CH<sub>2</sub>-O- linkage is formed within the backbone of the prepolymer as a hydrolyzable moiety; and,

reacting the prepolymer with a substance that removes all -O-CH<sub>2</sub>-O- terminal chains.

28. The degradable prepolymer product of claim 27, wherein the substance comprises a base or a base and hydrogen peroxide.

29. The degradable prepolymer product of claim 28, wherein the diol comprises polyethylene glycol comprising a molecular weight of about 400.

30. The degradable prepolymer product of claim 28, wherein the diol comprises polycaprolactone comprising a molecular weight of about 500.

The following claims have been amended (marked up version is attached to this filing):

3. (Once Amended) The degradable prepolymer of claim 21, wherein the prepolymer comprises a molecular weight of from about 2,000 to about 10,000.

4. (Once Amended) The degradable prepolymer of claim 21, wherein the prepolymer comprises monomer units of from about 300 to about 1,000 molecular weight.

5. (Once Amended) The degradable prepolymer of claim 21, wherein the prepolymer comprises monomer units of from about 400 to about 500 molecular weight.

6. (Once Amended) The prepolymer of claim 21, wherein the prepolymer comprises from about two to about ten -O-CH<sub>2</sub>-O- linkages within the backbone of the prepolymer.

8. (Once Amended) The degradable prepolymer of claim 21, wherein the prepolymer comprises a hydroxy-terminated prepolymer.

9. (Once Amended) The degradable prepolymer of claim 21, wherein the prepolymer comprises poly(PEG-400 formal).

10. (Once Amended) The degradable prepolymer of claim 21, wherein the prepolymer comprises poly(PCL-500 diol formal).

11. (Once Amended) The degradable prepolymer of claim 21, wherein the prepolymer comprises a functionality of from about 1.7 to about 2.3.

12. (Once Amended) The degradable prepolymer of claim 21, wherein the prepolymer comprises a functionality of approximately 2.

REMARKS

Claims 1, 2, and 13-20 have been deleted. Claims 21-30 have been added to more precisely define the scope of the invention. Claims 22, Claims 3-6 and 8-12 have been amended so that they depend upon newly added claim 21.

In a final office action in the application from which the present application continues, serial number 09/497,873, claims 1-12 and 16-22 stand rejected under 35 U.S.C. § 103(a). The examiner states that the claims are unpatentable over Lee et al. in view of Kim et al., Barnes et al., Adolph et al., and Hostettler. The examiner states in the Office Action that Lee et al. teaches a hydrolyzable binder and that Kim et al., Barnes et al., and Adolph et al. recite using prepolymers that contain poly oxymethylene therein.

However, none of the claimed inventions that the examiner relies upon teaches the more precisely defined claimed invention or discusses using poly oxymethylene groups within the backbone of the invention as a hydrolyzable moiety.

Regarding Lee et al., the examiner states that this reference teaches using low molecular weight prepolymers such as ethylene glycols to form polyesters and reacting these with polyisocyanates to form binders. The prepolymer and polymer disclosed in Lee et al. is a completely different class of polymer than the present invention with different chemical properties. For example, the binder formed by the prepolymer disclosed in Lee et al. is hydrolyzable to bases (i.e. aqueous ammonia), but the present invention is stable when reacted with bases. In fact, Lee et al. does not teach the preparation of a prepolymer or binder at all; Lee et al. merely discloses using a commercially available binder sold by Witco Corporation under the tradename FORMREZ YA23-4 within a plastic bonded explosive. Lee et al. does not teach

the preparation of a prepolymer or binder or the method of making or using a prepolymer or binder comprising a certain linkage within the backbone of said prepolymer that allows one skilled in the art to adjust the hydrolyzability of the binder to suit particular needs as does the present invention. Therefore, using Lee et al. for the basis of a 35 U.S.C. § 103 rejection is improper.

Regarding the remainder of the prior art cited by the examiner, none of this prior art discloses a formal polymer that is readily hydrolyzable and nothing in this prior art or within Lee would lead one skilled in the art to combine the references to obtain the present invention. First, none of the prior art teaches a prepolymer with oxymethylene only within the backbone of the prepolymer, so it acts as a hydrolyzable moiety. Also, none of this prior art discusses hydrolyzability or adjusting hydrolyzability. Hostettler et al. discloses polyurethanes that are not useful as binders for propellants or explosives because of the different mechanical properties associated with the disclosed polyurethanes. This is due to the shorter chain alcohols and increased amount of isocyanate used to prepare the polyurethanes. These polyurethanes are also not hydrolyzable due to their normal urethane linkage. The polymer disclosed in Barnes et al. cannot be hydrolyzed due to the triple bond in the alkyne and the Adolph et al polymer also cannot be hydrolyzed.

The examiner states that substitution of such prepolymers (as disclosed in Hostettler) that are otherwise taught in Lee would have been obvious to one skilled in the art. This is not correct. Obviousness is not merely predicated upon finding a portion of one composition in one reference and another portion of a composition in a second reference. First, there must be some impetus to combine the references. The examiner has set forth no such impetus. Second, examiner has argued in both office actions in the parent case that when dealing in the chemical

arts, unpredictability is a major issue. Applicant agrees to the extent that the unpredictability in the chemical arts flies in the face of the simplistic idea that one can take portions of different compositions and merely "stick them together" via replacement.

Regarding examiner's inherency argument, applicant argues that the added claims, which more precisely define the scope of the invention, differentiate where and how oxymethylene is found in the present invention prepolymer as compared to the cited references so that inherency is no longer at issue. None of the prior art references teach an oxymethylene linkage within the backbone of the prepolymer described in the present claims or one chemically similar as discussed above. None of the references discuss an oxymethylene linkage used in a prepolymer as a hydrolyzable moiety. These facts belie an inherency argument because the linkage at issue is not taught in the same configuration as found in present claims at issue. Therefore, applicant does not need to provide evidence of the references not possessing the claimed properties. However, as discussed above, none of the prior art reference polymer compositions are readily hydrolyzable. Therefore, any oxymethylene linkages found within such polymers do not possess the claimed properties of the present invention. This information was provided in the response to examiner's first office action, but was apparently ignored. Applicant requests that the examiner address this argument.

Finally, the examiner appears to base all of his obviousness arguments upon the breadth of the first independent claim. Although applicant has narrowed the breadth of the independent claims so that even this type of analysis is overcome, it is improper to merely address the broadest claim when all claims are rejected based upon obviousness. For instance, in applicant's original claims in the parent case, one claim teaches a very specific embodiment of the invention that comprises a monomer unit of a polycaprolactone having a molecular weight of about 500

with an oxymethylene linkage within the backbone. Examiner did not address this or other similarly narrow claims within the parent application. Instead, examiner merely sets forth overly broad obviousness arguments relating to only the broadest claims within the parent application. It is improper and unfair to applicant for the examiner to reject narrow claims, such as that set forth above, based upon obviousness, without some indication as to prior art references that supposedly make such specific embodiments of the present invention obvious.

Also, in the final office action in the application from which the present application continues, serial number 09/497,873, claims 1-20 stand rejected under 35 U.S.C. § 112, first paragraph as based upon a disclosure which is not enabling. First, applicant believes that newly added claims 21, 23, and 27, that more fully describe the invention, overcome any enablement problems. Second, the Office Action reiterates from the first Office Action that a single species is inadequate basis for a broad genus, particularly in the chemical field with its unpredictability when discussing the two specific examples set forth within the specification of the present application. In the first Office Action, the examiner also states on page 2 that "many such prepolymers are notoriously well known in the prior art" and "it is well settled that optimizing a result effective variable is well within the expected ability of a person of ordinary skill in the subject art." Applicant correctly pointed out the conflict of these statements, however, as above the examiner apparently did not address this argument in the final Office Action. Regardless, examiner's contention that two specific examples of how to prepare the present invention is insufficient, based upon the information within the specification and the claims, is in error. If one considers the general method set forth on the bottom of page 3 and top of page 4 of the specification, with the specific examples set forth on pages 4-6 of the specification, along with the preferred chemical properties of the invention set forth throughout the specification, one of

ordinary skill in the art can practice the invention. The specification first relates the general method of practicing the invention which is condensation of diols with formaldehyde. The specific examples show condensing a diol (certain polyethylene glycol and polycaprolactone monomers) with formaldehyde (trioxane), and adding a catalyst (borontrifluoride etherate) in order to create the prepolymer. The mixture is then diluted and a base or a base plus hydrogen peroxide is reacted with the prepolymer to remove any terminal oxymethylene chains. Specific molecular weights of preferred monomers to use in place of the polyethylene glycol or polycaprolactone monomer are set forth within the specification. One skilled in the art should be able to determine the molecular weight of a diol and calculate the stoichiometric ratios necessary in carrying out a reaction with formaldehyde in order to ensure that the reaction takes place. Examiner's mere assertion that the two specific examples are not sufficient for one of ordinary skill in the art to practice the invention is incorrect unless examiner is attempting to argue that one of ordinary skill in the art cannot calculate the molecular weight of a diol and calculate stoichiometric ratios of reactions.

Moreover, examiner has, again, not met his burden regarding the more narrow claims found in the present application. The present application sets forth claims going to the two prepolymers that are found in the specific examples of the preparation of prepolymers within the application. Therefore, for the examiner to include these two claims in an enablement rejection, at the very least, shows a lack of care in making such a rejection.

Finally, examiner argues that it was not clear that the oxymethylene linkages were within the backbone of the prepolymer, indicating that oxymethylene terminal groups were possible. The newly added claims make this issue moot. Claims 21, 23, and 27 clearly indicate that the oxymethylene groups are within the backbone, either due to all of the formaldehyde reacting



during preparation or by removing any terminal linkages after the initial preparation. Based upon these arguments, applicant believes that the amended claims meet the requirements of 35 U.S.C. § 112, first paragraph.

Lastly, in the parent application, claims 1-12 and 16-22 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to point out and distinctly claim the subject matter which applicant regards as the invention. The majority of the terms, typographical errors, etc. that the examiner objects to as being indefinite have been deleted or amended, and, therefore, are no longer at issue. However, the examiner has objected to terms within claims 9, 10, and 17, indicating his belief that these terms are trademarked. First, claim 17 has been deleted, so the terms within that claim are no longer at issue. Second, regarding the terms within claims 9 and 10, applicant is confused by the examiner's assertions of trademark. Although examiner does not specifically set forth the terms he believes are trademarked, applicant will assume that examiner refers to the prepolymer set forth in said claims. PEG merely is chemical shorthand for polyethylene glycol. The "400" merely indicates the molecular weight of the monomer unit and "formal" is merely descriptive of the structure. The prepolymer set forth in claim 10 is similar. These terms are standard shorthand used in the chemical arts. Although applicant has not done a trademark search on these terms, on their face, the terms are only descriptive in nature, and, therefore, legally should not be available for trademarked. Therefore, unless the examiner can provide more than the mere assertion that the terms are "apparently" trademarked, applicant asserts that the terms are merely descriptive in nature.

Finally, applicant also points out that using a new basis for rejection (i.e. that claims contain trademarked terms, making them indefinite), not found in the first office action or addressed in applicant's response to said office action, should prohibit a final rejection.

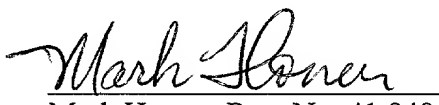
However, since applicant has decided to file this continuation application in lieu of pursuing the parent application, applicant will not focus on this issue.

Accordingly, applicant believes that claims 3-12 and 21-30 are in condition for allowance and respectfully requests the examiner to withdraw all objections and rejections and allow said claims. Should the examiner need more information regarding this matter, feel free to call the undersigned at 301-744-6668.

Respectfully submitted,

Dated: 5/9/01

OFFICE OF COUNSEL, CODE OC4  
NAVAL SURFACE WARFARE CENTER  
INDIAN HEAD DIVISION  
101 STRAUSS AVE., BLDG. D-326  
INDIAN HEAD, MD 20640-5035

  
Mark Homer, Reg. No. 41,848  
Attorney for Applicants

**Marked Up Version of Amended Claims**

3. (Once Amended) The degradable prepolymer of claim [2]1, wherein the prepolymer comprises a molecular weight of from about 2,000 to about 10,000.
4. (Once Amended) The degradable prepolymer of claim [2]1, wherein the prepolymer comprises monomer units of from about 300 to about 1,000 molecular weight.
5. (Once Amended) The degradable prepolymer of claim [2]1, wherein the prepolymer comprises monomer units of from about 400 to about 500 molecular weight.
6. (Once Amended) The prepolymer of claim [2]1, wherein the prepolymer comprises from about two to about ten -O-CH<sub>2</sub>-O- linkages within the backbone of the prepolymer.
8. (Once Amended) The degradable prepolymer of claim [2]1, wherein the prepolymer comprises a hydroxy-terminated prepolymer.
9. (Once Amended) The degradable prepolymer of claim [2]1, wherein the prepolymer comprises poly(PEG-400 formal).
10. (Once Amended) The degradable prepolymer of claim [2]1, wherein the prepolymer comprises poly(PCL-500 diol formal).
11. (Once Amended) The degradable prepolymer of claim [2]1, wherein the prepolymer comprises a functionality of from about 1.7 to about 2.3.
12. (Once Amended) The degradable prepolymer of claim [2]1, wherein the prepolymer comprises a functionality of approximately 2.